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RECENT CHANGES IN RING-BILLED AND CALIFORNIA GULL POPULATIONS IN THE WESTERN UNITED STATES

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Bent (1921) noted the decline of the Ring-billed Gull (*Larus delawarensis*) population since the 1840s, a phenomenon which he attributed to the intolerance of this species to disturbances at its breeding colonies. By the 1920s the Ring-billed Gull's breeding range, which previously extended across most of North America as far east as the Atlantic Ocean, had become restricted to lakes in the remote, unsettled regions of the western states and Canadian provinces. There, Bent (1921) believed, the Ring-billed Gull population was holding its own, except where encroached upon by expanding civilization.

The human population has greatly increased in the western United States and Canada since Bent's time and many formerly remote areas have now been settled. Whether this human settlement and the resultant environmental changes have had the deleterious impact on Ring-billed Gulls that Bent (1921) feared is uncertain. However, two studies of ring-bills, focusing on limited areas, have shown recent population growth in this species. Ludwig (1974) documented a large increase in the gull population of the Great Lakes. Conover et al. (1979) reported a similar population increase during this century of Ring-billed and California gulls (*L. californicus*) in the state of Washington.

Nonetheless, it is uncertain from these reports if population increases are local phenomena or are widespread throughout the breeding range. For this reason, I sought to determine the size of the current breeding populations of Ring-billed and California gulls in the western United States and to compare them to records of population size at the beginning of the 20th Century.

Man has been responsible for several environmental changes in the West during the present century which may have affected the Ring-billed Gull and California Gull populations by altering their food resources or nesting habitat. These changes include the creation of large water impoundments, the expansion of towns and cities with their garbage dumps, and the advent of large-scale farming. In addition, this study assesses any beneficial effects these changes may have had for the gulls by allowing them to establish new breeding colonies or expand existing ones.

METHODS

The area studied included the 17 western states, roughly encompassing the western half of the continental United States (Fig. 1). This area represents 30–40% of the total breeding

range of the Ring-billed Gull and about 50% of that of the California Gull (see Vermeer 1970). This region was thinly settled until the late 19th and early 20th centuries, thus providing an opportunity to evaluate man's impact on the population of these two gull species.

In a previous study (Conover and Conover 1981), the breeding populations of Ring-billed and California gulls during the 1920s were estimated from a literature survey of reports of gull colonies in the western U.S. before 1930. Breeding populations of these two species in the 1920s were estimated from total counts of breeding gulls from each colony for which population data were available. For colonies censused repeatedly, I used the population survey made closest to 1930. For those few colonies of undetermined size, I substituted the mean number of gulls per colony for colonies of known size.

To assess the 1980 Ring-billed and California gull breeding populations, I needed to determine the location and size of existing colonies. These data were obtained from my observations, published reports, the Colonial Bird Register, and by contacting state wildlife departments, national wildlife refuge managers, colleges and universities, cooperative wildlife and fisheries units, ornithologists, and Audubon groups. I estimated the current breeding population of each species as I had for the breeding population in the 1920s.

The construction of large reservoirs, establishment of towns and cities, or the advent of large-scale agriculture may have facilitated formation of new colonies through creation of new areas with adequate food resources and protection from mammalian predators. For each newly-reported colony, I examined any man-made environmental changes in the immediate vicinity. For example, to assess the importance of reservoirs, I counted the number of new colonies located on impoundments. To evaluate the potential effect of an expanding human population, I first examined census records (U.S. Census Bureau 1975) to document human population increases in the western U.S. since 1850. I also counted the number of colonies that were within 12, 24, or 36 km of towns by plotting them on maps of the U.S. Geological Survey (1970) which also provided data on the population of each town. These distances were selected because I found that, at least in Washington, most individuals of both species fed within 12 km of the colony with a few ranging to 36 km (Conover, pers. obs.). To ascertain if location of colonies in 1980 was non-random with respect to proximity to towns, I determined how frequently colonies were located within 36 km of a town with a population >1000. I then compared this frequency to the frequency of randomly-selected points which were also located within 36 km of a town having >1000 residents. These points were randomly placed on a map of the breeding range of these gulls in the western U.S. I then used a contingency table corrected for continuity to test for significant differences ($P < 0.05$) in the proportion of colony sites and random sites which were near towns.

I also used census records (U.S. Census Bureau 1975) to calculate any changes in farm acreage and irrigated farm acreage in the West since 1850. I then determined how many of the 1980 gull colonies were within 36 km of an area where the principal land use was either for cropland or for irrigated cropland, using maps from the U.S. Geological Survey (1970). This frequency was then compared to the frequency of randomly-selected points also near agricultural areas. By using a contingency table corrected for continuity, I was able to determine if the location of colonies was non-randomly distributed with respect to agricultural areas and areas of extensively irrigated farmland.

RESULTS

The sizes and locations of colonies of these two gulls in the western U.S. during the 1920s and in the 1970s are given in Appendix 1 and 2, respectively. During the 1920s, 17 California and 16 Ring-billed gull colonies were reported in the West (Figs. 1, 2). Reports of two California Gull and four Ring-billed Gull colonies based on second-hand information

FIG. 1. Location of Ring-billed Gull colonies in the western U.S. before 1930.

were regarded as questionable. Although Dawson (1923) mentioned California Gulls nesting on Lake Tahoe and along the Sacramento River he never actually visited those locales. I found no other references to these alleged colonies. There are some California Gull eggs in the collections at the Museum of Vertebrate Zoology (Univ. California) possibly collected along the Sacramento River (Grinnell and Miller 1944). Reports of Ring-billed Gull colonies on the Belly River, Flathead River, McDonald Lake, and St. Mary's Lake in Montana may also be spurious (Bailey 1918). Bailey (1918) apparently did not visit these sites himself and I could find no other evidence of the existence of these colonies. The absence of additional

FIG. 2. Location of California Gull colonies in the western U.S. before 1930.

reports suggests that if these alleged colonies did exist, they probably were occupied for only a few years. Thus, only 15 or so *L. californicus* colonies and 12 *L. delawarensis* colonies apparently existed in the western U.S. during most of the 1920s.

In 1980, Ring-billed Gulls nested in 57 colonies (Fig. 3), an increase of 356–475% depending on the inclusion of questionable pre-1930 colonies. Available population data from 83% of the pre-1930 colonies (Appendix 1) indicated that before 1930, the mean number of breeding Ring-billed Gulls per colony was 397. Hence, based on 12 colonies, the total known Ring-billed Gull population in the western U.S. prior to 1930 was 4800. In 1980,

FIG. 3. Location of current Ring-billed Gull colonies in the western U.S.

the mean number of breeding Ring-billed Gulls per colony was 1867, a five-fold increase in mean colony size since 1930. Thus, the Ring-billed Gull population in the western U.S. was about 106,000, some 22 times larger than the apparent population in the 1920s.

In 1980, California Gulls nested in 80 colonies (Fig. 4). This was 471–533% higher than in the 1920s depending on the inclusion of questionable pre-1930 colonies. The mean number of breeding California Gulls per colony prior to 1930 was 6734 based on data from 93% of the early colonies. Thus, based on 15 colonies, the pre-1930 population of California Gulls in

FIG. 4. Location of current California Gull colonies in the western U.S.

the western U.S. was 101,000. In 1980, the mean number of breeding California Gulls was 3455, a decrease of 51% in colony size since 1930. Hence, the current California Gull population in the western U.S. was approximately 276,000, 2.7 times larger than before 1930.

Much of the increase in California Gull numbers has occurred in the northern states. The number of colonies in Washington rose from 1 to 11, in Idaho from 1 to 10, in Montana from 2 confirmed colonies to 18, and in North Dakota from 5 to 17. By 1980, California Gulls were still nesting in only 8 of 17 colony sites dating from the 1920s and Ring-billed Gulls only occupied 6 of 12 earlier sites.

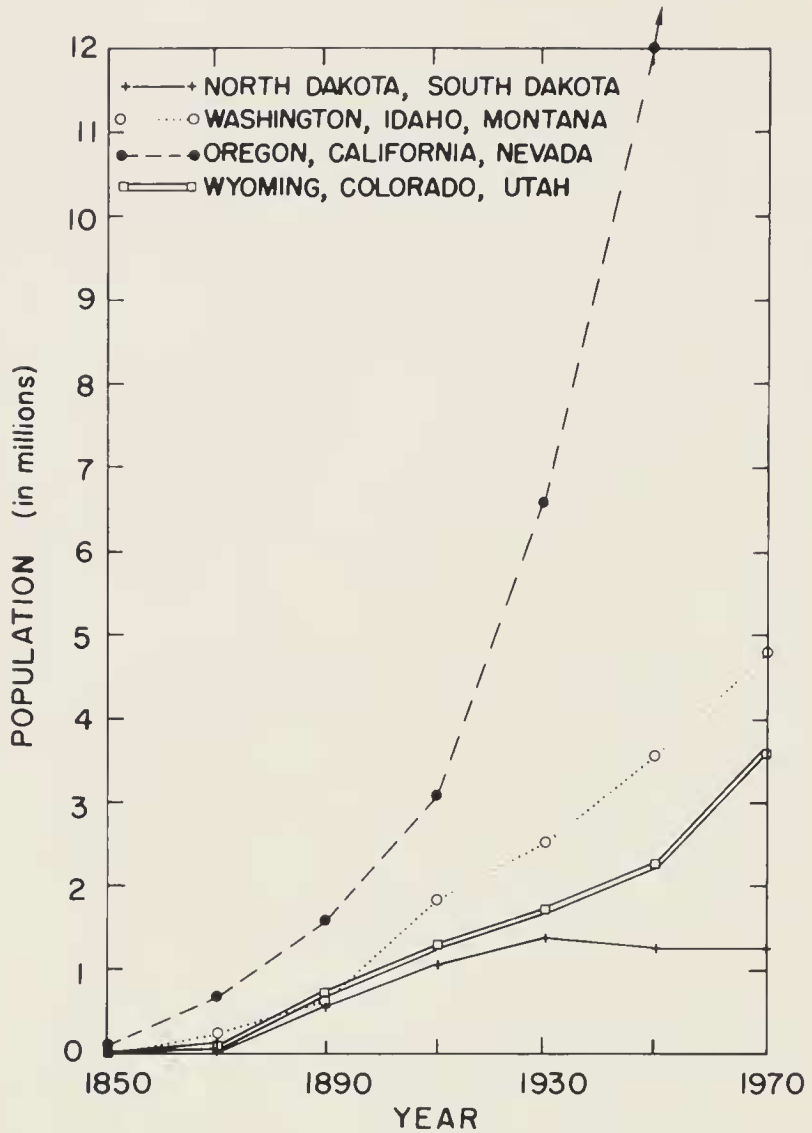

FIG. 5. Changes in the human population in different parts of the western U.S. since 1850.

Surprisingly, before 1930 over 80% of the total California Gull breeding population in the western U.S. was centered on Great Salt Lake in Utah. Then the number of breeding gulls on this lake declined from around 82,800 in 1932 to only 41,000 in the late 1940s (Behle 1958). The estimated population of 50,000 in 1980 shows a slight increase over the late 1940s but falls far short of the 1932 estimated total. Elsewhere in the western U.S., California Gull populations have increased from an estimated 18,210 in the 1920s to 226,000 in 1980.

The creation of reservoirs throughout the western U.S. has certainly contributed to, though not solely caused by, the growth of these gull populations. Of Ring-billed and California gull colonies established in the western

TABLE 1
PERCENTAGE OF COLONIES LOCATED WITHIN 12, 24, AND 36 KM OF CERTAIN-SIZED TOWNS

Population of towns	12-km radius	24-km radius	36-km radius
>1000	39.0%	61.0%	84.4%
>5000	22.1%	33.8%	49.4%
>10,000	16.9%	27.3%	40.3%

U.S. since 1930, 33% were located in new breeding habitat on man-made reservoirs.

Also of probable importance to the gull population increases in the West has been the burgeoning of human settlements with associated garbage dumps providing new sources of food (Fig. 5). Many of the 1980 colonies were near towns or cities: 84% were within 36 km of a town with >1000 people and 40% were within 36 km of a town with >10,000 inhabitants (Table 1). Only 45% of the randomly-selected locations were within 36 km of a town with a population exceeding 1000. This was significantly lower ($\chi^2 = 28.69$, df = 1, $P < 0.001$) than for gull colonies, indicating that gull colonies were not randomly located with respect to human settlement.

Furthermore, increased farm acreage in the western U.S. since the 1900s (Fig. 6) has also expanded potential food sources for gulls; in fact, 96% of the colonies in 1980 were situated within 36 km of areas where the main land use was for agriculture. This also was significantly higher ($\chi^2 = 15.19$, df = 1, $P < 0.001$) than the 75% of randomly-selected locations near agricultural areas. In particular, irrigated farmland in the western U.S. increased from 1,500,000 ha in 1890 to 5,700,000 ha in 1930 and to 14,200,000 ha in 1970 (U.S. Census Bureau 1975). In 1980, 74% of the colonies were located within 36 km of an area with extensive irrigated cropland, although only a small fraction of the total farm acreage was irrigated. This frequency was significantly greater ($\chi^2 = 18.44$, df = 1, $P < 0.001$) than the 41.3% of random locations which were near irrigated farmland. This association of gull colonies with irrigated acreage was particularly strong in the Pacific Northwest in contrast to the situation in eastern Montana, Colorado, North Dakota, and South Dakota where there was little irrigated farming. Outside this latter area, 95% of the new colonies were within 36 km of extensive areas of irrigated cropland.

DISCUSSION

Accuracy of the population estimates.—Total accuracy in the population estimates is difficult to achieve for several reasons. Colonies may have

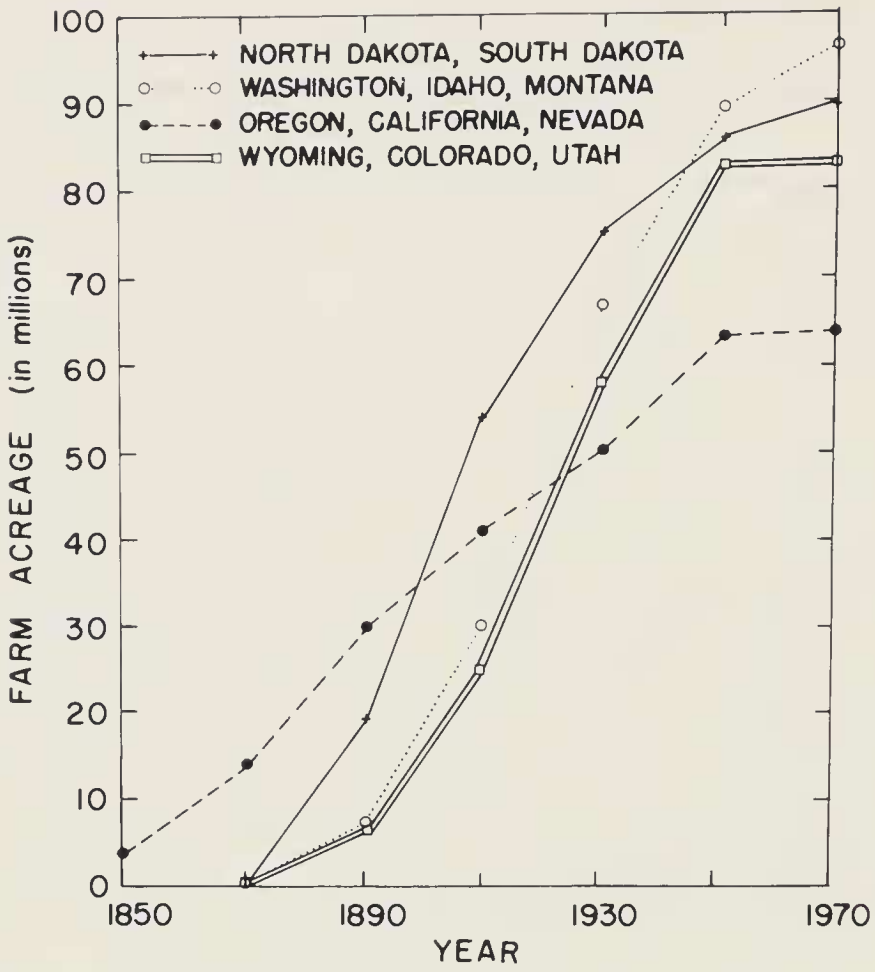

FIG. 6. Changes in farm acreage in different parts of the western U.S. since 1850.

been missed, making the population estimates conservative. However, the last 20 reports of gull colonies which were received contained only one new colony suggesting that only a small percentage of colonies may have been overlooked. Any error stemming from missed colonies, would likely have a greater effect on pre-1930 population estimates because there were fewer ornithologists then. Conversely, there may be an overestimation of the total number of colonies in existence prior to 1930, because some reported colonies were undoubtedly deserted in any one year. Whether these two factors counter-balance each other is unclear. Yet another source of error has resulted from observers estimating rather than counting numbers of birds both in current and pre-1930 colonies. For most of the pre-1930 colonies, however, there were at least two independent estimates of colony size (Conover and Conover 1981). Given these limitations, the population figures should be regarded as minimum estimates.

Reasons for the population changes.—Increases in Ring-billed and California gull populations in the western U.S. may have been influenced by

two developments similar to those causing the Ring-billed Gull population growth in the Great Lakes: the use of new food sources and the creation of suitable breeding habitat (Ludwig 1974). Food sources and breeding habitat have increased in these two areas for different reasons. In the Great Lakes, new breeding habitat was created during a period of low water, which exposed new islands (Ludwig 1974), but in the West, many new colonies are now located on islands in new reservoirs. This creation of islands has allowed gulls to establish new colonies in areas which previously lacked suitable breeding sites. Likewise, the establishment of alewives (*Alosa pseudoharengus*) in the Great Lakes provided a new food source for gulls (Ludwig 1974). In the West gulls have exploited new terrestrial food sources created by man, e.g., garbage dumps and other sources of human refuse. Modern agriculture has also created new food sources used by Ring-billed and California gulls. The proximity of contemporary colonies to large agricultural areas suggests the potential importance of agricultural food supplies for California and Ring-billed gulls.

Apparently farming based on irrigation has especially benefitted these gulls. Conover et al. (1979) noted that these gulls in eastern Washington spent more time feeding in irrigated than non-irrigated fields, although the latter greatly outnumbered the former in acreage. Baird (1977) also reported that Ring-billed Gulls in Montana foraged mainly in irrigated fields, with California Gulls feeding more in the plains and non-irrigated fields. Throughout the Pacific Northwest in 1980, most colonies were near areas with extensive irrigated farmland.

Agricultural fields may be a more important food source for Ring-billed and California gulls than garbage dumps and human settlements. Vermeer's (1970) extensive study in Alberta revealed that rodents, insects, and grain (types of food gulls gather from cultivated fields) were the principal components of most food samples. Garbage rarely comprised more than 5% of the food samples collected in May and June, although in some areas, its importance increased in July. Other studies of food habits in the Great Lakes (Jarvis and Southern 1976, Haymes and Blokpoel 1978), Montana (Rothweiler 1960), California (Anderson 1965), and Utah (Greenhalgh 1952) have shown that insects were an important part of the diet of these gulls. It would appear that garbage was less important even though two of these studies (Greenhalgh 1952, Haymes and Blokpoel 1978) were conducted near large urban areas.

Perhaps the Ring-billed Gull population has increased more than the California Gull in the western United States, in part, because of the different food habits of the two species. Ring-billed Gulls feed more in upland areas than do California Gulls; ring-bills consume more insects and grain, whereas California Gulls eat more carrion and garbage (Rothweiler 1960,

Anderson 1965, Vermeer 1970). Consequently, any increase in the availability of grain and insects might well have a greater influence on Ring-billed Gulls than California Gulls. The increase in farming activities would create such a situation.

Also contributing to the Ring-billed and California gull population growth is reduced predation pressure, although to what extent is unclear. Certainly man poses less of a threat to these gulls today; gulls are no longer killed for their plumage nor are their eggs regularly taken for food although at present gulls are probably disturbed more by human activities in their breeding colonies and by senseless shootings.

Ring-billed and California gulls are not the only species that have increased in numbers in the 20th Century. Other gull species also increasing during this century include the Great Black-backed Gull (*L. marinus*) in New England (Drury 1973); the Dominican Gull (*L. dominicanus*) in Wellington, New Zealand (Fordham 1967, 1970); the Lesser Black-backed Gull (*L. fuscus*) in Britain (Parslow 1967, Harris 1970); and the Herring Gull (*L. argentatus*) in both Europe (reviewed by Spaans 1971) and North America (Kadlec and Drury 1968, Drury 1973). These increasing populations have usually been attributed to reduced predation and exploitation of garbage dumps as a food source. Recently, the population of some of these gull species has stabilized (Fordham 1970, Drury and Kadlec 1974).

Whether Ring-billed and California gull populations will continue to increase is unpredictable, especially given the growing demands for recreational or commercial use of lakes and islands where these gulls breed. For instance, the large colony of California Gulls at Mono Lake may eventually be threatened by Southern California's increasing need for water. The population explosion of these gulls has had some harmful repercussions, such as increased depredation on the eggs and young of waterfowl (Odin 1957, Vermeer 1970), damage to cherry orchards (Behle 1958), and increased danger of collisions with aircraft (Blokpoel 1976). However, given the benefit which these two gull species provide farmers in reducing the insect and rodent populations in their fields (see Behle 1958), and their beauty and aesthetic value, any further increase in population should be encouraged whenever local conditions permit.

SUMMARY

During the last 50 years, the Ring-billed Gull (*Larus delawarensis*) breeding population in the western United States has increased from a minimum of 4800 to 106,000 individuals in 1980. This increase, approximately 22-fold, is manifested in two forms: an increase in mean colony size from 397 to 1867 breeding adults and a proliferation of colonies from 12 to 16 in the 1920s to 57 today. Concomitantly, the breeding population of California Gulls (*L. californicus*) in the western U.S. has more than doubled, from ca. 101,000 to 276,000 in 1980. Interestingly, while the number of California Gull colonies has increased from 15 in 1930 to 80 in 1980, the

mean number of gulls per colony has decreased, from 6734 to 3455 during the same period. Both gull species have apparently benefitted from increased food supplies resulting from edible human garbage and agricultural practices. Also aiding the proliferation of these gulls has been the creation of new nesting habitat on islands formed by large reservoirs and the reduction of human predation by egg and plumage hunters.

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APPENDIX 1

RING-BILLED GULL AND CALIFORNIA GULL COLONIES IN WESTERN U.S. DURING THE 1920S[a]

State	Colony name	California Gull	Ring-billed Gull	Source
California	Clear Lake	1800	200	Willett (1919), Lincoln (1933)
	Eagle Lake	4	—	Ray (1915, 1921), Grinnell et al. (1930)
	Hartson Reservoir	—	300	Moffitt (1942)
	Mono Lake	3400	—	Dawson (1923), Grinnell and Storer (1924)
	Sacramento River	breeding	—	Dawson (1923), Grinnell and Miller (1944)
	Tahoe Lake	breeding	—	Dawson (1923)
Nevada	Pyramid Lake	14	—	Hall (1926), Grommc (1930)
Oregon	Malheur Lake	3500	1000	Willett (1919), Gabrielson and Jewett (1940)

Appendix 1
Continued

State	Colony name	California Gull	Ring-billed Gull	Source
Washington	Moses Lake	—	breeding	Kitchin (1930)
Idaho	Walcott Lake	—	breeding	Cooke (1915)
Montana	Belly River	—	breeding	Bailey (1918)
	Big Lake	—	20	Saunders (1921)
	Bowdoin Lake	50	1000	Willett (1907), Weydemeyer and Marsh (1936)
	Flathead River, North Fork	—	breeding	Bailey (1918)
	McDonald Lake	—	breeding	Bailey (1918)
	St. Mary's Lake	—	breeding	Bailey (1918)
Wyoming	Yellowstone Lake	1128	300	Skinner (1917), Kemies (1930), Wright (1934)
Utah	Egg Is. (Great Salt Lake)	1200	—	Palmer (1916), Behle (1935)
	Hat or Bird Is. (G.S.L.)	20,000	—	Allee (1926)[b], Behle (1935)
	Gunnison Is. (G.S.L.)	60,000	—	Court (1908), Behle (1935)
	White Rock (G.S.L.)	500	—	Court (1908), Behle (1935)
	Utah Lake	2000	—	Hayward (1935), Behle (1945)
North Dakota	Chase Lake	80	320	Bennett (1926)
	Devil's Lake	breeding	100	Bent (1921), Wood (1923)
	Harriett Lake	—	330	Stevens (1930)[c], Stewart (1975)
	Stump Lake	600	400	Bent (1921), Wood (1923), Stewart (1975)

[a] Western states not listed had no known colonies.
[b] As cited by Behle (1958).
[c] As cited by Stewart (1975).

APPENDIX 2

RECENT CALIFORNIA GULL AND RING-BILLED GULL COLONIES IN THE WESTERN U.S.

Colony name (county)	Year observed	California Gull	Ring-billed Gull	Source
California				
Clear Lake (Modoc)	?	breeding	breeding	E. J. O'Neill (pers. comm.)
Goose Lake (Modoc)	1977	1205	—	D. W. Winkler (pers. comm.)
	1977	1200	<20	S. A. Laymon (pers. comm.)
Hartson Reserv. (Lassen)	1977	10	160	S. A. Laymon (pers. comm.)
	1977	15	100	D. W. Winkler (pers. comm.)
	?	breeding	breeding	P. F. Springer (pers. comm.)
Lower Klamath Lake (Siskiyou)	?	breeding	breeding	E. J. O'Neill (pers. comm.)
	1980	4000	—	S. A. Laymon (pers. comm.)
Mono Lake (Mono)	1980	40,217	—	D. W. Winkler (pers. comm.)
Tule Lake (Siskiyou)	1976	1980	11,818	E. J. O'Neill (pers. comm.)
	?	—	breeding	P. F. Springer (pers. comm.)
Nevada				
Lahontan Reserv. (Lyons)	?	breeding	—	G. B. Herron (pers. comm.)
Pyramid Lake (Washoe)	?	breeding	—	G. B. Herron (pers. comm.)
	?	breeding	—	D. W. Winkler (pers. comm.)
	1980	2950	—	M. Ross (pers. comm.)
Reno City Parks (Washoe)	?	breeding	—	G. B. Herron (pers. comm.)
Truckee River	?	breeding	—	G. B. Herron (pers. comm.)
Washoe Lake (Washoe)	?	breeding	—	G. B. Herron (pers. comm.)
Wild Horse Reserv. (Elko)	?	breeding	—	G. B. Herron (pers. comm.)
Oregon				
Baker Sewage Lagoon (Baker)	?	breeding	breeding	F. Newton (pers. comm.)
	?	breeding	—	J. P. Mazzoni (pers. comm.)
Pelican Lake (Lake)	?	400	400	F. Newton (pers. comm.)

Appendix 2
Continued

Colony name (county)	Year observed	California Gull	Ring-billed Gull	Source
Summer Lake (Lake)	?	601	90	F. Newton (pers. comm.)
Upper Klamath Lake (Klamath)	1979	breeding	breeding	F. Newton (pers. comm.)
Washington				
Banks Lake (Grant)	1977	1690	5436	Conover et al. (1979)
Cabin Island (Grant)	1977	4	250	Conover et al. (1979)
Island 18 (Franklin)	1977	5910	4492	Conover et al. (1979)
Little Memaloose Is. (Klickitat)	1977	856	—	Conover et al. (1979)
Miller Rocks (Klickitat)	1977	960	60	Conover et al. (1979)
Potholes Reserv.	1977	436	2292	Conover et al. (1979)
Richland (Franklin)	1977	3600	4710	Conover et al. (1979)
Sprague Lake (Adams)	1977	428	1702	Conover et al. (1979)
Three-mile Canyon	1977	4380	4380	Conover et al. (1979)
Whitcomb Is. (Grays Harbor)	1976	—	4	Penland and Jeffries (1977)
Willapa Bay (Pacific)	1976	—	40	Penland and Jeffries (1977)
Idaho				
American Falls Reserv. (Bingham)	1972	15,000	8000	Peterson (unpubl.)
	1979	30,000	12,000	C. H. Trost (pers. comm.)
Barson Is. (Payette)	1972	1000	—	Peterson (unpubl.)
Bear Lake (Bear Lake)	?	400	—	Peterson (unpubl.)
	1979	600	—	G. L. Deutscher (pers. comm.)
Blackfoot Reserv. (Caribou)	?	8000	—	Peterson (unpubl.)
	?	breeding	—	E. W. Loth (pers. comm.)
	1979	10,000	1000	C. H. Trost (pers. comm.)
Couer d'Alene (Kootenai)	1977	—	40	Conover (pers. obs.)

APPENDIX 2
CONTINUED

Colony name (county)	Year observed	California Gull	Ring-billed Gull	Source
Island Park Reserv.	?	breeding	—	Peterson (unpubl.)
	1979	deserted	—	C. H. Trost (pers. comm.)
Magic Reserv. (Blaine)	1972	1600	1200	Peterson (unpubl.)
	1978	10,000	—	C. H. Trost (pers. comm.)
Market Lake (Jefferson)	?	breeding	breeding	Peterson (unpubl.)
	1979	deserted	deserted	C. H. Trost (pers. comm.)
Mud Lake (Jefferson)	?	breeding	breeding	Peterson (unpubl.)
	1979	+2000	600	C. H. Trost (pers. comm.)
Smith Is. (Washington)	1972	1000	400	Peterson (unpubl.)
	1980	5000	2000	R. R. Hoffman (pers. comm.)
Twin Lakes Reserv. (Camas)	?	breeding	3400	Peterson (unpubl.)
Walcott (Blaine)	?	700	50	Peterson (unpubl.)
	?	6000	—	C. H. Trost (pers. comm.)
	1979	1200	—	J. D. Hill (pers. comm.)
Utah				
—Great Salt Lake Colonies				
Bear River Bay (Box Elder)	1982	2492	—	Paul (unpubl.)
Egg Island (Davis)	1982	3502	—	Paul (unpubl.)
Farmington Bay W.M.A. (Salt Lake)	1982	20	—	Paul (unpubl.)
Great Salt Lake Mineral & Chemical Co. (Weber)	1982	5356	—	Paul (unpubl.)
Gunnison Island (Box Elder)	1982	3032	—	Paul (unpubl.)
Hat Island (Box Elder)	1982	10,997	—	Paul (unpubl.)
Lake Point Salt Co. (Toole)	1982	2740	—	Paul (unpubl.)
Morton Salt Co. (Salt Lake)	1982	9476	—	Paul (unpubl.)
Ogden Bay-Pintail Flats (Weber)	1982	8706	—	Paul (unpubl.)

APPENDIX 2
CONTINUED

Colony name (county)	Year observed	California Gull	Ring-billed Gull	Source
Ogden Bay-Unit 2 (Weber)	1982	112	—	Paul (unpubl.)
Promontory Point (Box Elder)	1982	1172	—	Paul (unpubl.)
Rock Island (Weber)	1982	2036	—	Paul (unpubl.)
Salt Creek W.M.A. (Box Elder)	1982	200	—	Paul (unpubl.)
—Other Utah lakes				
Utah Lake—Geneva Dike (Utah)	1982	6591	—	Paul (unpubl.)
Utah Lake—White Lake (Utah)	1982	8981	—	Paul (unpubl.)
Neponset Reserv.	1982	3680	—	Paul (unpubl.)
Montana				
Arod Lake (Teton)	1955	breeding	breeding	L. M. Moos (pers. comm.)
	?	breeding	breeding	J. E. Smith (pers. comm.)
Alkali Lake (Pondera)	1976	breeding	breeding	L. M. Moos (pers. comm.)
Benton Lake (Cascade)	?	breeding	breeding	P. D. Skaar and L. M. Moos (pers. comm.)
	1979	648	—	R. L. Pearson (pers. comm.)
	1980	736	—	R. L. Pearson (pers. comm.)
Bowdoin Lake (Phillips)	?	breeding	breeding	R. L. Eng (pers. comm.)
Broadview Marsh (Yellowstone)	1979	50	—	B. Haglan (pers. comm.)
Canyon Ferry (Broadwater)	1980	280	40	R. L. Eng (pers. comm.)
Freezeout Lake (Teton)	?	breeding	breeding	D. Childress (pers. comm.)
	?	breeding	breeding	J. E. Smith (pers. comm.)
	1980	2000	2000	L. M. Moos (pers. comm.)
Fort Peck Reserv.	?	breeding	breeding	J. E. Smith (pers. comm.)
	?	—	breeding	P. D. Skaar and L. M. Moos (pers. comm.)
—Gull Is. and York Is.	?	500	500	B. Haglan (pers. comm.)
—Beaver Is.	?	—	1525	K. G. Becker (C.B.R.)[a]

Appendix 2

Continued

Colony name (county)	Year observed	California Gull	Ring-billed Gull	Source
Mason Lake (Musselshell)	?	breeding	breeding	P. D. Skaar and L. M. Moos (pers. comm.)
	?	200	—	B. Haglan (pers. comm.)
Medicine Lake (Sheridan)	?	breeding	breeding	B. Haglan (pers. comm.)
	?	breeding	breeding	J. E. Smith (pers. comm.)
	1980	breeding	breeding	S. W. Breeser (pers. comm.)
Ninepine N.W.R. (Lake)	?	breeding	breeding	R. Magaddino (pers. comm.)
	?	100	225	H. H. Null (pers. comm.)
Lima Reserv. (Beaverhead)	1980	400	—	R. R. Sjostrom (pers. comm.)
Tiber Reserv. (Liberty)	?	rumored	—	J. E. Smith (pers. comm.)
Veseth Slough (Phillips)	1980	probably	probably	R. L. Eng (pers. comm.)
Whitewater Lake (Phillips)	1977	probably	probably	R. L. Eng (pers. comm.)
Yellow Water Reserv. (Petroleum)	?	200	200	B. Haglan (pers. comm.)
Wyoming				
Bamforth Lake (Albany	?	breeding	breeding	H. Harju (pers. comm.)
Torrington (Goshen)	?	—	breeding	H. Harju (pers. comm.)
Seedskadee N.W.R. (Sweetwater)	?	—	probably	H. Harju (pers. comm.)
Yellowstone Lake (Teton)	?	breeding	breeding	H. Harju (pers. comm.)
Colorado				
Antero Reserv. (Park)	1980	800	—	R. A. Ryder (pers. comm.)
Eleven-mile Reserv. (Park)	1978	150	—	C. W. Loeffler (C.B.R.)
Riverside Reserv. (Weld)	1977	76	—	G. C. Miller (C.B.R.)
	1980	200	—	R. A. Ryder (pers. comm.)
North Dakota				
Audubon Lake (McLeon)	1979	230	—	U.S.D.I. (1980)
	1980	228	152	R. D. Shape (pers. comm.)

Appendix 2
Continued

Colony name (county)	Year observed	California Gull	Ring-billed Gull	Source
Big Meadows (Williams)	1978	—	50	T. Fuller (pers. comm.)
Chase Lake (Stutsman)	?	breeding	breeding	Stewart (1975)
	1976	1558	6694	G. R. Lingle (pers. comm.)
	1977	886	6166	N. R. Sloan (C.B.R.)
Devil's Lake (Benson)	1979	248	818	U.S.D.I. (1980)
East Devil's Lake (Ramsey)	?	breeding	breeding	Stewart (1975)
	1976	—	300	L. Brundin (C.B.R.)
	1979	breeding	breeding	U.S.D.I. (1980)
J. Clark Sayler N.W.R. (McHenry)	?	—	breeding	Stewart (1975)
	1979	—	deserted	U.S.D.I. (1980)
	1979	—	breeding	T. W. Stewart (pers. comm.)
Long Lake	?	—	breeding	Stewart (1975)
	1979	—	deserted	U.S.D.I. (1980)
Pelican Lake (McLeon)	1979	432	1540	U.S.D.I. (1980)
Peterson Lake (Burleigh)	?	breeding	breeding	Stewart (1975)
	1978	187	2247	K. S. Wilson (C.B.R.)
	1979	320	3520	U.S.D.I. (1980)
Phoenix Township (Burleigh)	1979	—	12	U.S.D.I. (1980)
Sakakawea Lake (Mountrail)	1979	440	2500	U.S.D.I. (1980)
Stony Lake (Kidder)	?	breeding	breeding	Stewart (1975)
	1979	—	814	U.S.D.I. (1980)
Stump Lake (Nelson)	1980	breeding	—	S. Konzak (pers. comm.)
Upper Lostwood Lake (Burke)	?	—	breeding	Stewart (1975)
			deserted	U.S.D.I. (1980)

Appendix 2
Continued

Colony name (county)	Year observed	California Gull	Ring-billed Gull	Source
Westby (Divide)	?	breeding	breeding	Stewart (1975)
	1977	breeding	breeding	T. Fuller (pers. comm.)
Williams Lake (McLeon)	?	breeding	breeding	Stewart (1975)
	1977	356	300	R. A. Schmidt (pers. comm.)
	1978	470	—	K. J. Wilson (C.B.R.)
	1978	674	—	J. F. Herman (C.B.R.)
	1979	608	—	U.S.D.I. (1980)
Willow Lake (Roulette)	?	—	breeding	Stewart (1975)
	1979	—	deserted	U.S.D.I. (1980)
South Dakota				
Bitter Lake (Day)	?	—	breeding	Johnsgard (1979)
North Drywood Lake (Roberts)	?	?	breeding	Johnsgard (1979)
	1977	—	310	B. K. Harris (C.B.R.)
South Wauby Lake (Day)	1979	—	128	L. L. Watters (pers. comm.)

[a] C.B.R.—Colonial Bird Register.